

# Welcome to NordicWay 3 Webinars

27<sup>th</sup> – 28<sup>th</sup> November



**Co-financed by the European Union**  
Connecting Europe Facility

# Program

27<sup>th</sup> – 28<sup>th</sup> November

## Day 1 – 27th november

<b>Start: 9.00</b>	Opening by Anna Johansson Jacques
<b>9.10</b>	Interchange & Ecosystems
<b>10.30</b>	Coffee Break
<b>10.45</b>	Interchange & Ecosystems
<b>11.30</b>	Lunch Break
<b>12.30</b>	Traffic Signal Information & Priority
<b>14.00</b>	Coffee Break
<b>14.15</b>	Deployment of Road Works Warning (RWW) and road pricing
<b>End: 16.00</b>	

## Day 2 – 28th november

<b>Start: 8.30</b>	Cellular C-ITS from studies to deployments
<b>10.15</b>	Coffee Break
<b>10.30</b>	Digital flow of traffic regulation and AI powered discrepancy analysis
<b>12.10</b>	Lunch Break
<b>13.00</b>	Evaluation results
<b>14.45</b>	Coffee Break
<b>15.00</b>	Panel discussion & Closing
<b>End: 16.00</b>	



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# Introduction

## Gjermund Jakobsen, NPRA



# Interchange & Ecosystems

27<sup>th</sup> – 28<sup>th</sup> November

## Practical information

- The session will be recorded
- No guests can unmute or turn on their camera – Organizer must give permission
- Q&A at the end of the session, please write your questions in the chat window during the presentations.

Questions that we don't have time for live will be answered in the chat or after the webinar



The session will cover the ecosystem around Interchange. From explaining the purpose to evaluating the cost and operation of Interchange Network. Followed up by a demonstration how data can be shared across international borders using the federated Interchanges together with the National Access Points. To wrap up the session will we look at a roadmap that shortly describe the development of ITS services in the NW3 work and beyond

## **9.10 Introduction**

## **9.15 Interchange explainer**

## **9.35 Recommendations for Interchange Network deployment**

## **9.55 Evaluation within Governance and cost & operation of Interchange network**

## **10.10 Q&A**

## **10.30 Break**

## **10.45 Introduction**

## **10.50 NAPCore / NordicWay demonstration**

## **11.05 Standards and international cooperation**

## **11.20 Q&A**



# Interchange explainer Menno Malta, Monotch



# Interchange & Eco-systems (1)

## Menno Malta, Monotch



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**Monotch makes Traffic talk**  
Connecting mobility  
and  
digital infrastructure

 **United States**  
Office

 **Germany**  
Office

 **UK**  
Representation

 **Flanders, Belgium**  
Large-scale production-grade environment/deployment. Procured by AWV, used on highways and in cities

 **The Netherlands**  
UDAP  
Large scale production grade environment/deployment. Procured by Ministry of Transport for all road authorities (cities, regions, highways)

 **Copenhagen and Trondheim**  
Successful C-ITS Traffic Light pilots with cities and OEM's.

 **Sweden**  
Nordic **WAY**  
Pilot environment. Used by Trafikverket and cities for broad set of C-ITS traffic use-cases (RWW, IVS, TLC, EVA)

 **Finland**  
**TAMPERE** TLEX  
Pilot environment. Procured by Finntraffic and Tampere for C-ITS traffic light use-cases

 **New Zealand**  
RWW warnings



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# Interchange definition according to C-Roads

- AMQP Databroker platform following C-Roads protocols:
  - Basic Interface (BI)
  - Improved Interface (II)
- BI is used for:
  - publishing (streaming) data by publishers (called Capabilities)
  - receiving data by consumers (called Subscriptions)
  - Messages should have a geoheader and must be signed
- II is used for:
  - federating Interchanges (create a network of Interchanges)



# Swedish Interchange in NW3

- Capabilities:
  - Traffic light information (SPAT/MAP)
  - Traffic light priority (SRM/SSM)
  - Vehicle probe data (CAM)
  - RWW (DENM)
  - EVA (DENM)
  - IVS (DatexII)
  - NAPCORE Datex Situation records (Roadworks, Closed road, Accidents)
- Federation:
  - With Norway interchange (Vegvesen)
  - With second Swedish interchange (Monotch)
- RWW and TLC messages are signed centrally the Swedish interchange (EU PKI L0)
- Participated in C-Roads cross border testing w/BI (Slovenia, Italy, Finland, Austria)



# DEMO NW3 Interchange



# Known interchanges and ingress volumes

- Spain (Galicia), volume unknown
- Austria, volume unknown
- Italy, 8 DENM, 12 IVIM
- Slovenia, approx 100 messages per day
- France, approx 500 intersections
- Norway, approx 350k – 450k messages per day
- Czech republic, approx 500k messages per day
- Sweden, approx 2m messages per day
- Flanders, Belgium, approx 15.5m messages per day
- Netherlands, approx 750m per day



# C-Roads Interchange ...

Does not specify.....



- How to manage connections?
- How do we scale?
- How do we deal with other data interfaces and message types?
- How can we govern this?
- What about data quality?



# TLEX Interchange NW3



What	How
Manage connections	Local Actor API (defined together with Vegvesen)
Scale	TLEX backplane brings Sharding / Ultra low latency / horizontal scalability
Different data types and formats	Supports AMQP, MQTT, HTTP, Websocket, C-ITS subject interface and more Can exchange all message types (C-ITS ETSI, DatexII, XML etc.)
Message signing	Use central signing to sign messages from trusted sources (EU LO PKI)
Governance	Supervisor can manage access through advanced access policies Supports multiple authority eco-system Provides stakeholder dashboards and interfacing
Data quality	Monitor and manages connection quality, message quality and use-case quality





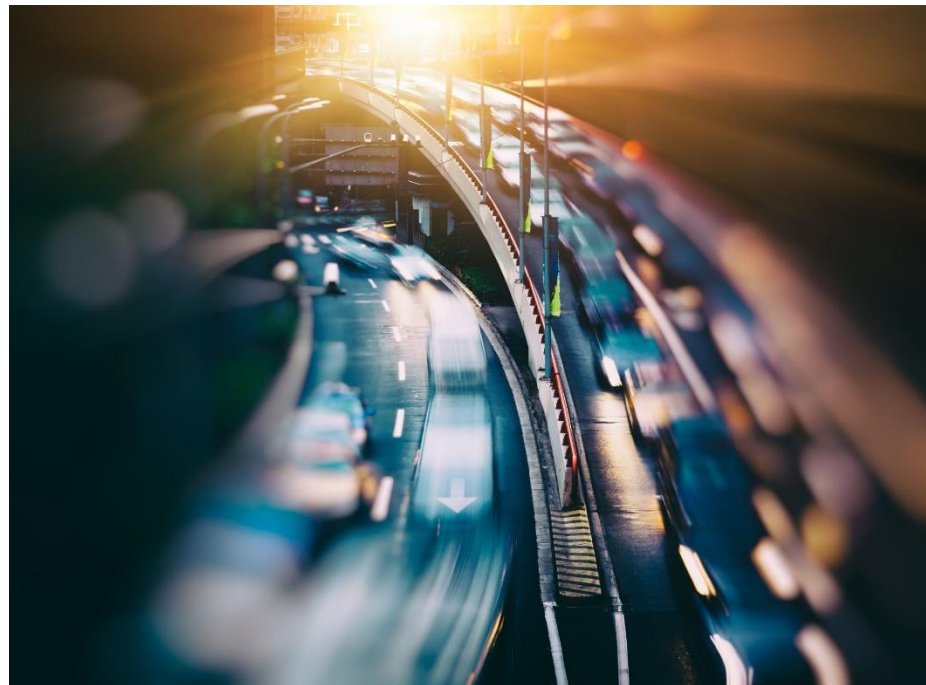
**Want to know more:**

Check the [TLEX Comparison report](#)

Menno Malta

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# Recommendations for Interchange Network deployment

Ted Kruse, Lindholmen Science Park AB  
Jonas Höglund, ÅF Infrastructure AB



# RECOMMENDATIONS FOR INTERCHANGE NETWORK DEPLOYMENT



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# Content

- International perspective
- Technical ability
- Benefits
- Governance
- Cyber security
- Ownership, financing and maintenance
- Recommendations



# International Perspective - Digitalization of the Transport system

- Most countries struggle with obstacles in the transport system that traditionally have been solved by expanding the existing physical infrastructure
- Digitalization and C-ITS services will play an important role to overcome those existing challenges and many different initiatives have emerged
- The NordicWay project is a good example of such an initiative where Interchange network constitutes the core
- The Nordic countries are a part of something bigger and cannot create a C-ITS ecosystem on their own







# International Perspective – C-ITS

- A digitalized transport system with real-time C-ITS functionality is emerging, as required by the ITS Directive and its 2023 Amendment.
- Several initiatives within the EU are addressing the creation of this C-ITS ecosystem, e.g:
  - C-Roads
  - NAPCORE
  - European Mobility Data Space
  - Data for Road Safety
  - Car 2 Car Communication Consortium
- The NordicWay Interchange is a solution enabling the creation of such C-ITS ecosystem, that is likely to be compatible with the rest of Europe.

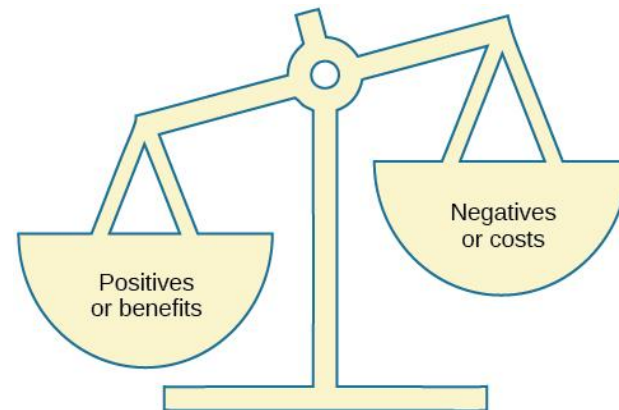
# Technical ability – feasible solution

- The Interchange solution developed in the NordicWay project has clearly demonstrated the ability to create a working platform for the exchange of real-time C-ITS messages in the traffic infrastructure.
- Based on the C-Roads specifications, it is likely to be compatible with other countries implementing data exchanges using the same specifications.



# Benefits

- Piloted services within NordicWay3 have clear societal impacts which do not necessarily directly benefit the actors offering or implementing the solution that is made possible by the Interchange network.
- The Interchange network is primarily an enabler, both for C-ITS services and future autonomous driving services, to exist, but not the least the important capabilities to support a federated C-ITS ecosystem.
- Not to forget; the traveler's perspective and the expectation of a harmonized and borderless transport system regardless of road operator and country.





# Governance

- We believe that a systematic governance on national and international level will be required to reach harmonization in such a complex ecosystem within and across borders.
- Regulations are seen as a crucial factor for how a data exchange platform in the transport system would be owned and operated.
- The ITS Directive and the 2023 Amendment will guide how certain data exchange should occur in the transport system within the EU.



# Cyber Security

- Basic aspects like PKI are covered in the implementation of ICN
- Cyber security aspects of the Interchange Network needs more investigation
  - Does the ICN constitute a civil security risk as a target for attacks?
  - Can a nonfunctional ICN lead to major disturbances in the road traffic?
- Authorities on civil security have not been willing to give their opinion on this topic.

svt.se 4th September 2023



– Det är totalstopp och ingen kommer fram, säger Sami Akcay butiksanställd på Circle K vid universitetsområdet, till SVT Stockholm under måndagskvällen. Foto: Sami Akcay

## Norra länken avstängd flera timmar – trafiken släpps nu på

UPPDATERAD IDAG 09:00 PUBLICERAD IGÅR 16:54

Norra länken, som går norr om Stockholm, har under hela måndagskvällen haft stora tekniska problem i tunnelsystemet. Trafiken har nu släppts på, uppger Trafikverkets presschef Bengt Olsson till TT strax före klockan 22.

Felet upptäcktes vid 16:30-tiden på måndagseftermiddagen och alla in och utfarter stängdes till tunnelsystemet.

– Alla tunnlar har en massa tekniska lösningar, allt från fläktar till sprinklersystem. Det har vi en dygnet runt-övervakning på, hur alla säkerhetssystemen och ventilationssystem fungerar. Men alla våra skärmar är helt svarta. Släcks en bildskärm, eller om vi inte kan se hur utrustningen mår, då måste vi stänga tunneln, sa Olsson tidigare under kvällen.

### Tekniker letar febrilt

Situationen påverkade allt som rör trafiken i Stockholm.

*“The northern link, which runs north of Stockholm, had major technical problems in the tunnel system throughout Monday evening. Traffic has now been resumed the Swedish Transport Agency’s press manager Bengt Olsson told TT shortly before 10 p.m.*

*The fault was discovered at 16:30 on Monday afternoon and all entrances and exits to the tunnel system were closed.*

*- All tunnels have a lot of technical solutions, everything from fans to sprinkler systems. We have round-the-clock monitoring of how all the security systems and ventilation systems work. But all our screens are completely black. If a monitor goes out, or if we can't see how the equipment is doing, then we have to close the tunnel, Olsson said earlier in the evening.*

### Technicians are frantically searching

*The situation affected everything related to traffic in Stockholm.”*



# Ownership - Financing - Maintenance

- Decisions on financing and ownership have not been taken and communicated by all Nordic transport authorities. It means a risk that the Nordic Interchange network will not exist after the finalization of the research project NordicWay 3
- What is the consequence of that, for the future of
  - The transport system itself
  - Fulfilment of the ITS directive
  - Agenda 2030
  - Vision zero
  - Other societal benefits
- The different standpoints from the Nordic transport administrations creates uncertainty among the ecosystem actors, especially actors from the private sector.
- Maintaining the operation of the Interchange Network:
  - constitutes a platform for further research and pilots
  - demonstrates the scalability of the solution if operated in all Nordic countries
  - will call for necessary continued cooperation between Nordic countries



# Recommendations



1. Continue financing the Interchanges that are already deployed.



2. One interchange per country will be minimum, but yet sufficient.



3. Establish national security guidelines/rules for an Interchange



4. The Interchange shall be owned, financed and maintained by a public authority, most likely the road authority



5. Establish the necessary internal responsibilities and authorities for operation of the Interchange within each Nordic road authority



# Recommendations



6. Align the Nordic countries' solutions for C-ITS, including the Interchange



7. Define and establish a continued cooperation between the Nordic road authorities for C-ITS



8. Establish an arena for cooperation with the private sector (OEMs) after the end of NordicWay



9. Continue to participate in the EU financed working groups, e.g. EMDS, C-Roads



10. Differences, similarities and relations between Interchange and National Access Point (NAP) needs to be described and communicated





# Thank you for listening!

## Contact Us for Questions:

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# Evaluation within Governance and cost & operation of Interchange network Tarald Fidjeland, Sopra Steria





# EVALUATION REPORT – ACTIVITY 4

## *Governance and cost & operation of interchange network*

*Tarald T. Fidjeland, Sopra Steria*



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# Scope and mandate



## The evaluation report's scope and mandate has been to:

- Coordinate and connect with the work that Lindholmen Science Park and Afry have done in activity 3 which concerns business models around the "interchange network".
- Evaluate how "governance" can be exercised within such a network;
  - Governance at EU level
  - Governance at the Nordic level
  - (Governance at the national level)
- Evaluate the costs of introducing, operating, and developing such a network.



# Conducted work

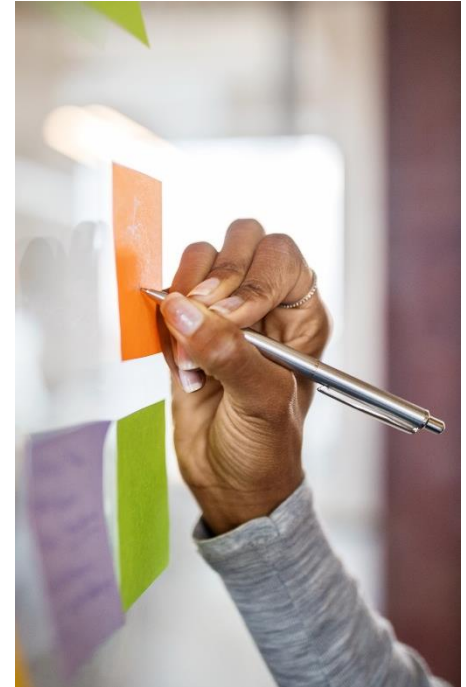
## Litterature review

- AFRY & Lindholmen Science Park
- Other relevant Nordic Way reports
- Relevant EU Directives and strategies

## Interviews

- Semi-structured interviews

## Data collection and structuring



# Our respondents

No	Actor	Type of organisation	Number of respondents
1	The Norwegian Public Roads Administration / Statens vegvesen (NO)	Government agency	7
2	The Swedish Transport Administration / Trafikverket (SE)	Government agency	2
3	Fintraffic (FI)	State-owned company	2
4	Bouvet (NO)	Commercial company	2
5	The Danish Road Directorate / Vejdirektoratet (DK)	Government agency	1
6	Scania (SE)	Commercial company	1
7	Monotch (NE)	Commercial company	1



# Main findings - value, business model and funding

## Value-add

### Advantages:



A strong potential business case for third-party suppliers

Reduced costs

Easier use of data for OEMs and car owners

Mature and up-to-date technology

Fulfilling transport policy objectives

### Disadvantages:



Market already taken by commercial companies

Lack of data quality and user-cases

## Business models and funding



Strong support for initial public funding



Third-party suppliers are key



Funding follows data quality



At this point, low commercial interest for transport safety data



# Main findings – governance

## EU level



To gain value, the Interchange must be organized at an EU level

Others: EU complicates initiatives – national approaches is needed as a start

## Nordic level



A Nordic administrative Interchange secretariat

## National level

- **Norway:** Support for initial public funding + national initiative and governance through NPRA
- **Sweden:** Commercial companies already taken the market. Need strong arguments in order to join a Nordic approach to an Interchange network
- **Denmark:** Support for initial public funding. Undecided future for the national Interchange initiative.
- **Finland:** Started to develop an open-source Interchange network in 2023. Will initiate connection to the Swedish Interchange network. Undecided future for the national Interchange initiative



# Main findings – other findings



Lack of knowledge among decision-makers



Data quality – not format – is key



Different national approaches



A high-level decision needed to secure the Nordics position as a digital front-runner



Three different respondent groups: Advocates, supporters and doubters





# Main findings – costs

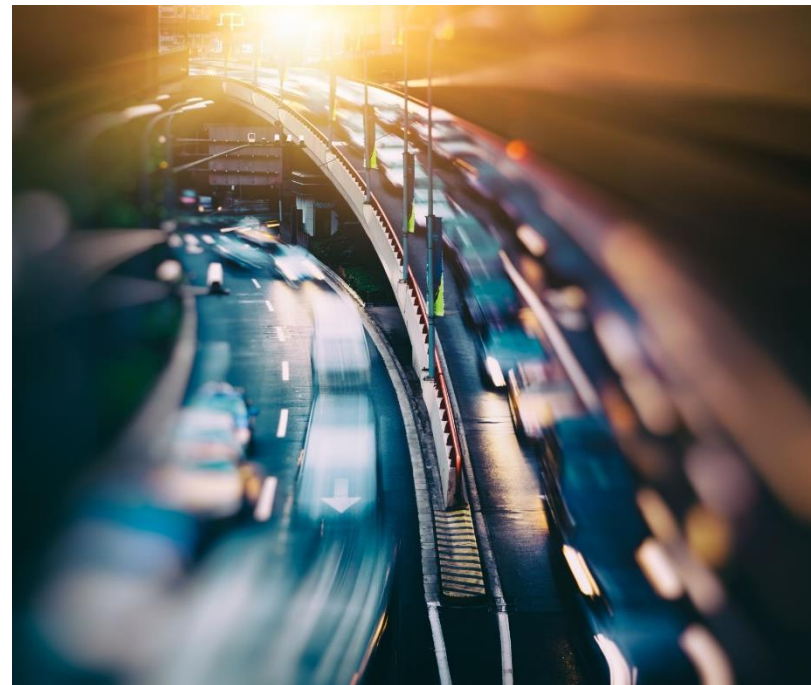
- Respondents presented few cost estimates:
  - Comparing to alternative costs
  - Less infrastructure investments required
  - Expect public sector to fund
- Potential cost drivers: Organizational size, chosen governance structure and development costs
- Lack of data due to:
  - Uncertainty communicated from respondents and stakeholders
  - Development costs are hard to estimate
  - Public tenders

Category	Comment	Annual estimates
Operational costs	Operation with up-time from 7pm to 4am seven days a week.	€100 000
Server costs	Monthly fee to e.g., Google Cloud.	€2500 – 3500
Human resource costs	Costs related to in-house competence. We recommend on employee working full-time with the Interchange.	€60 000 – 80 000
<b>In total</b>		<b>€162 500 – 183 500</b>

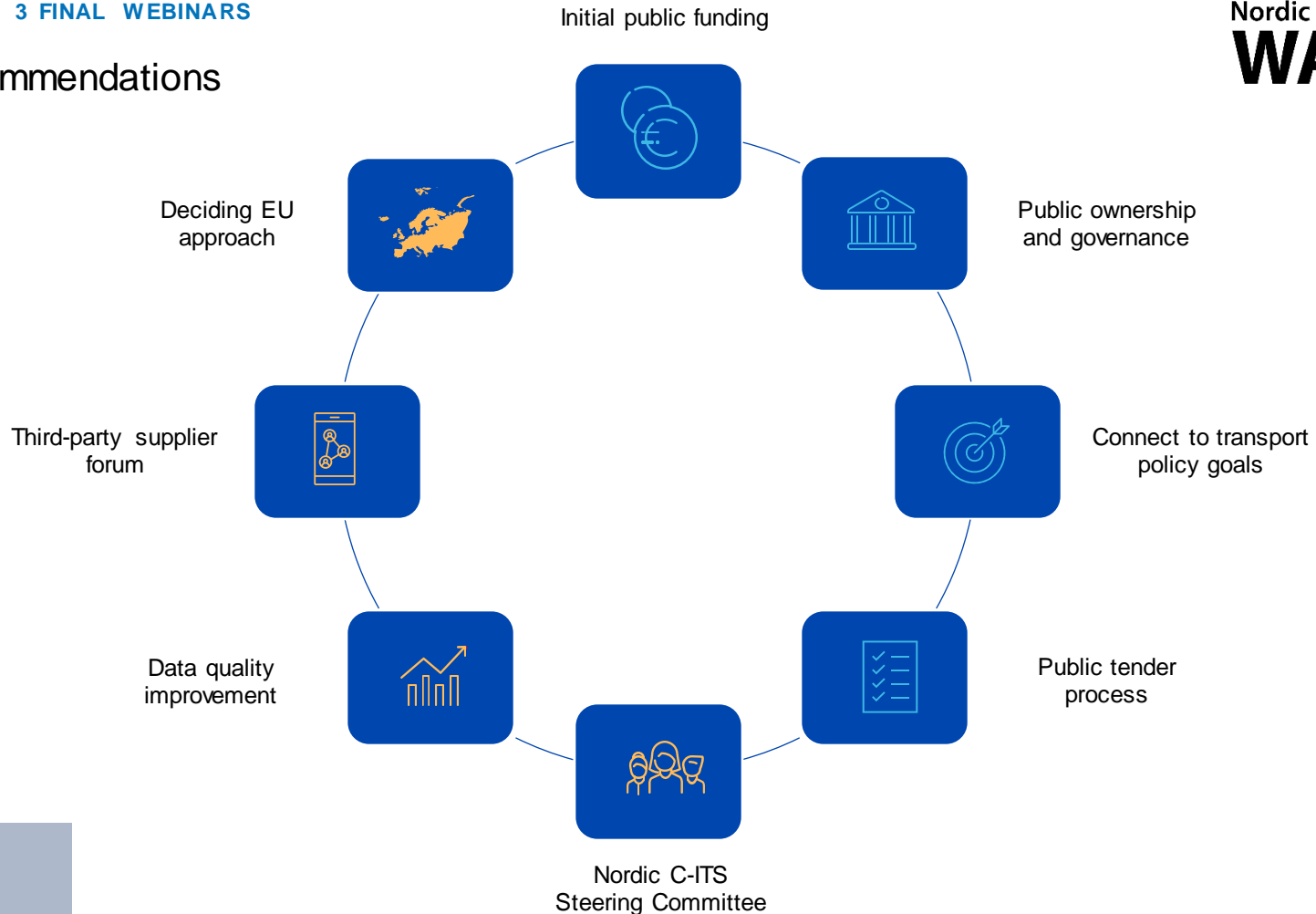


# Possible ways going forward

- **Alternative 1:** The way the Interchange has been developed during the whole NW3 period, from 2015 to today. Includes continuous work, and the requirements have been changed or developed during the project period. Considered a costly way of doing it.
- **Alternative 2:** Involves adding Interchange functionality in an “existing” system with basic functions. Considered a less costly solution.
- **Alternative 3:** This approach uses already existing Interchange, and gradually adapts minor local specifications.

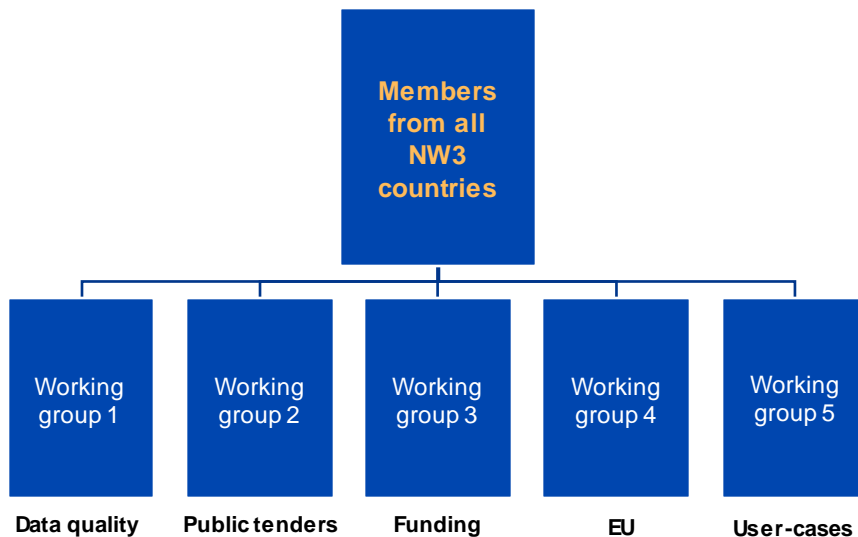


## Our recommendations



# Our recommendations

## Nordic C-ITS Steering Committee



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# Thanks for your attention

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sopra  steria



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Q&A



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# Introduction

## Gjermund Jakobsen, NPRA





# NAPCore / NordicWay demonstration

## Kenneth Sørensen, NPRA



# NAPCORE/ NordicWay demonstrator



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*«A live demonstration of sharing cross border metadata and real-life data»*



# Agenda

- What is NAPCORE?
- Description of the demonstrator
- Video of the demonstration
- Results



# What is NAPCORE

- CEF funded EU project
- Harmonize mobility data platforms across Europe
- Maintenance of DATEX II



# Description of demonstrator

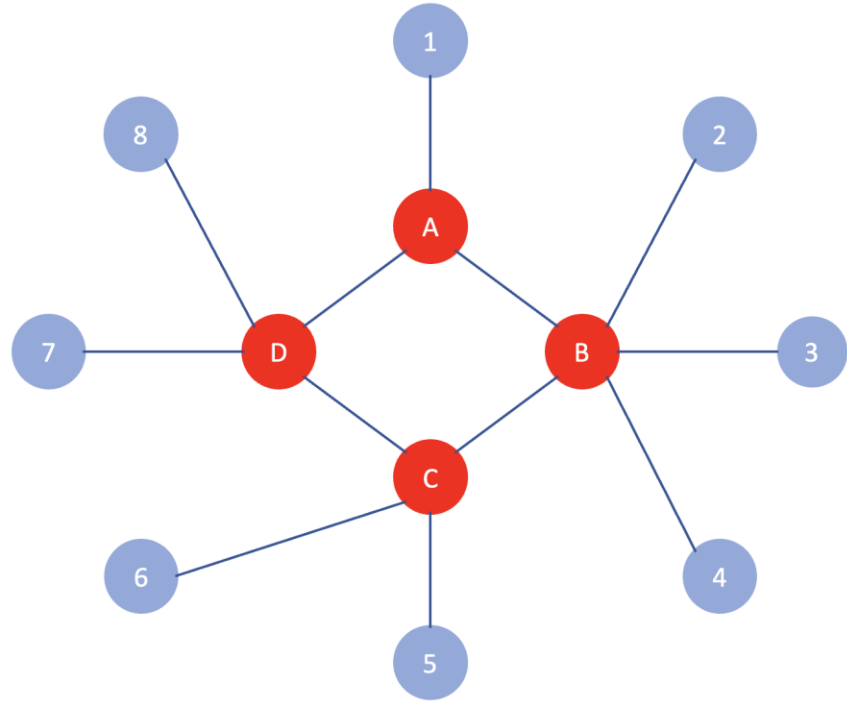
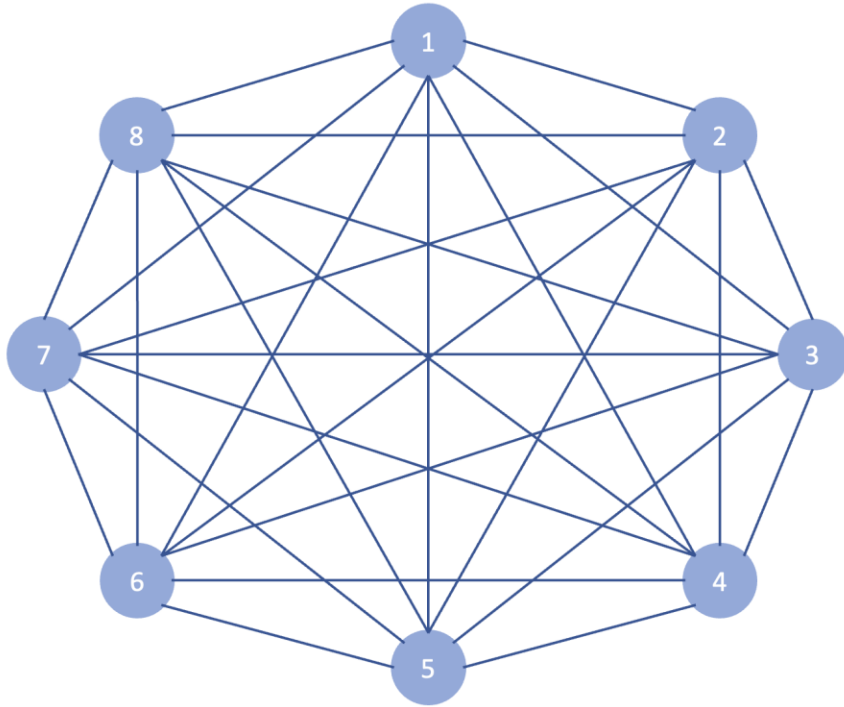


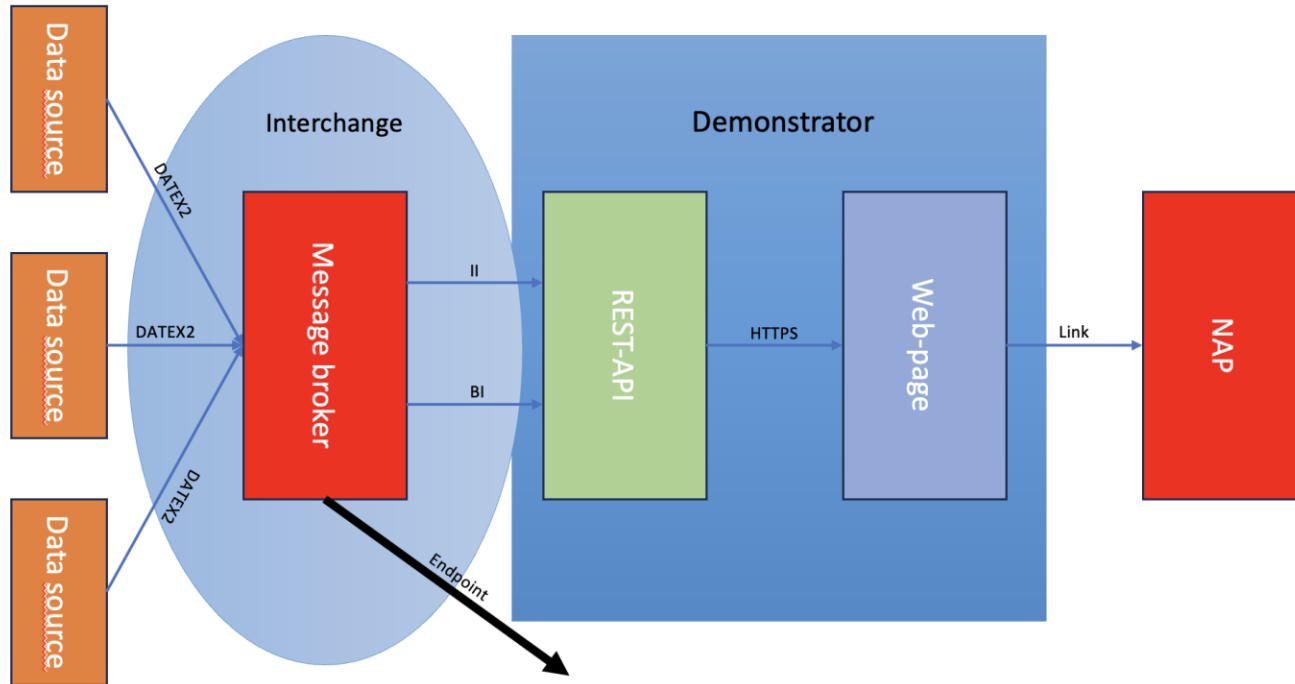
- Overcome the challenges of European-wide metadata and data sharing
- Collaborative metadata and data sharing practices among different nations and their NAPs
- Relevant metadata and real-time data accessible to all interested parties through any NAP





# Complex to simple





Microsoft Teams

# NAPCORE: BeMobile will be demonstrating - easy findable and ac...

2023-10-24 07:30 UTC

Recorded by

Christian Rantzow von  
Huth

Organized by

Christian Rantzow von  
Huth



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# Feedback

*«So, we can see that it was very easy. We have one platform where we can receive all traffic information from different countries. The integration for the different countries is actually identical, so when you integrate one country, you can very easily add additional countries»*

*Jan Vossaert, Backend Developer, Be-Mobile*



# Feedback

*«If all countries or a group of countries had set up such a system, then that would make our technical work a lot easier. That is certainly fair to say»*

Wannes De Smet, Offering Manager Traffic Information, Be-Mobile



# Thank you!

[Kenneth.Sorensen@vegvesen.no](mailto:Kenneth.Sorensen@vegvesen.no)



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# Standards and international cooperation

## Alf Peterson, RISE





From vision to reality - a question of standards and  
international cooperation!  
**The use of standards and why.**



# The presentation

- Background
- ITS-Directive and development platforms
- Findings
- Next steps



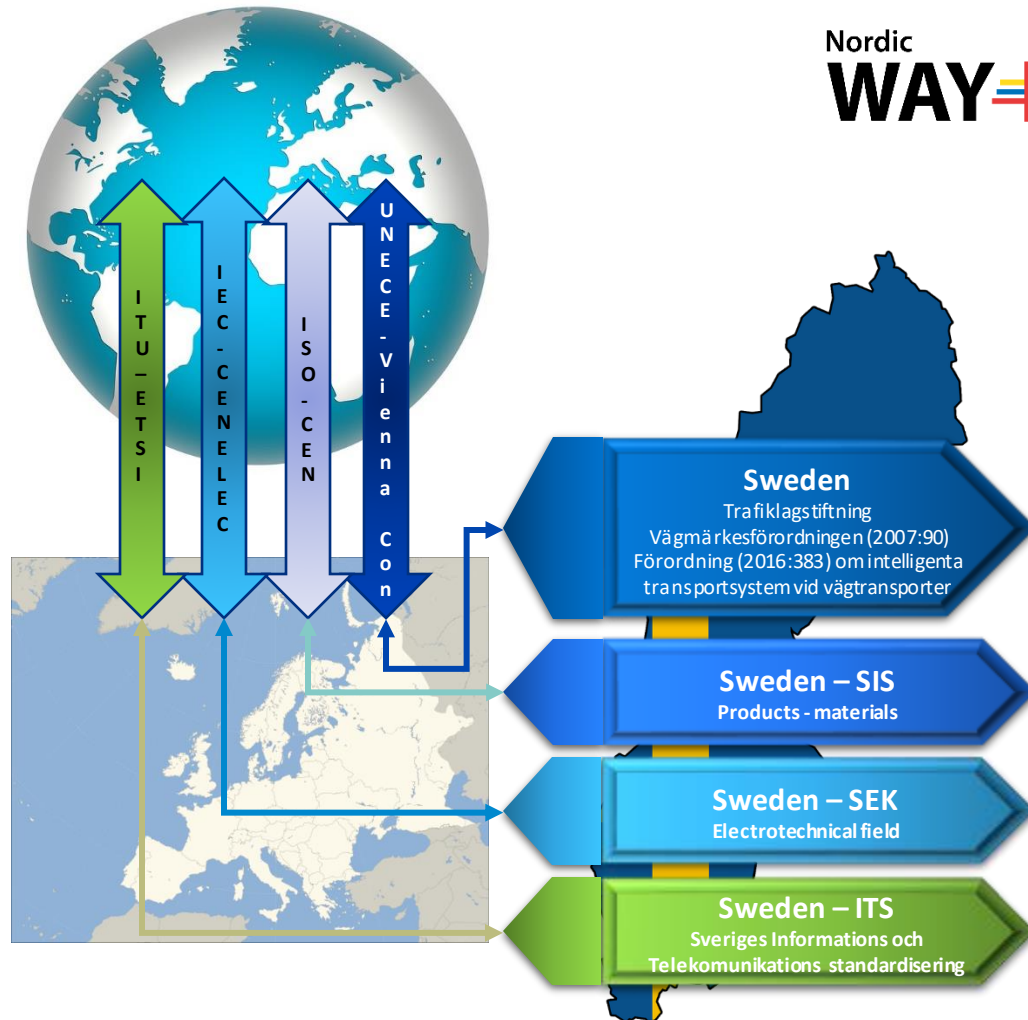
# Background



- Towards Cooperative, Connected Autonomous Mobility
- Many years of cooperation within EU
- Many stakeholders
- Operate cross-border



## Relations between different standards and legal organisations

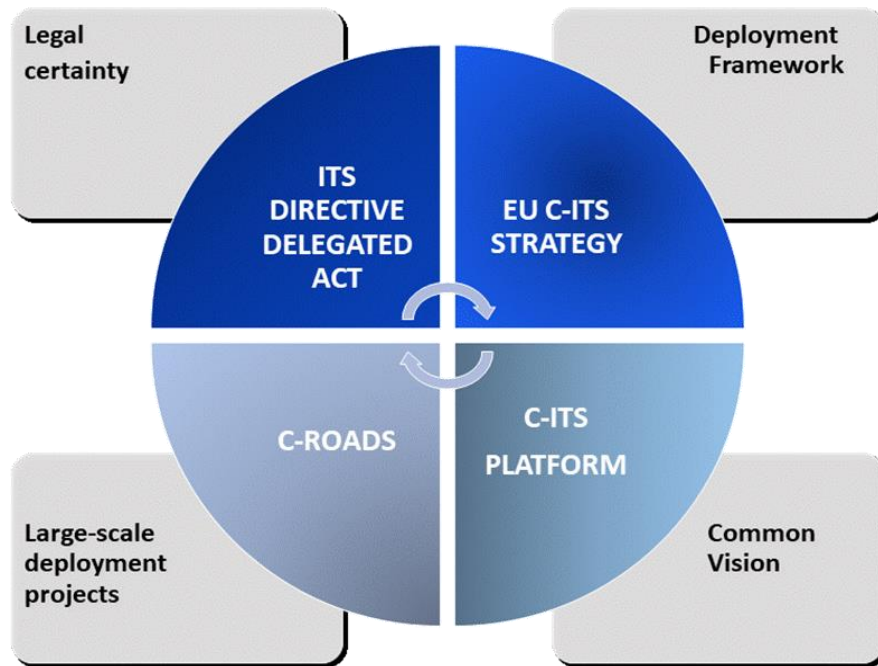




# ITS Directive and the development platforms

- The revised ITS Directive adopted October 2023
  - Implementing
  - Working program
  - Implementing program
- Platforms within EU COM
  - C-ITS Strategies
  - C-Roads Large scale test
  - Recommended standards

**C-Roads ends 2023-12-31**





# Maturity of DAY 1 Services with respect to standards

	C-ITS Services				Enabler
KPI's	Emergency Vehicle Approaching	Road Works Warning	Traffic Signal (info, priority, MAP)	In Vehicle Signage – Motorway Control	InterChangeNod /Digital Infra structure
C-Roads compliant	Yes	Yes	Prio: Partly Info: Yes****) MAP: Yes	Yes&No???	Yes&No***)
City/Regional	Yes	Yes	Yes	Yes	Yes
National	Yes, 90%	Yes	Yes	100%	100%
Cross-border	Yes	Yes	Yes	TBD	Yes
Deviation to std's	No	No	No	Datex today **)	
Cyber security /PKI	TBD	Yes *)	Yes ****)	TBD	TBD

\*) Level 0

\*\*\*\*) Certificate

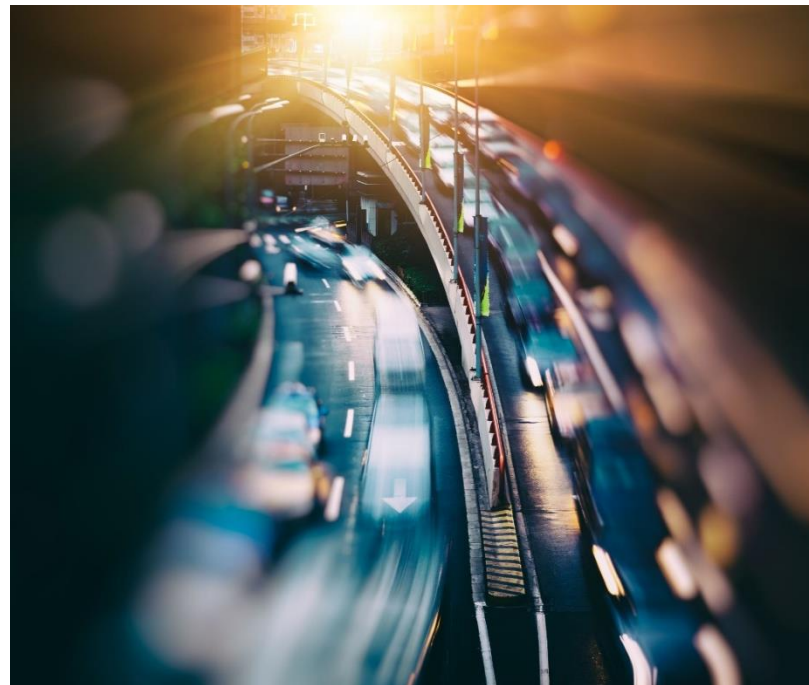
\*\*) ETSI tomorrow "promised" by STA

\*\*\*) Norway and Finland continue with ICN. Sweden?



# Next step - after 2023

- A lot of activities going on within EU, BUT it is time to get experience, it is not only a question of technique
  - the road users, ecosystem
- C-ITS Maturity – EVA & RWW are ready to start!
- Interchange node - a prerequisite
- Cooperation and Governance - continue and implement security
  - C-Roads 2.0 is needed!
- Euro NCAP – a driving force?!



# Questions?

NW3 Report:

Cooperative and connected vehicles towards autonomous driving.

From vision to reality - a question of standards and international cooperation?

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Johan Östling, RISE, [johan.ostling@ri.se](mailto:johan.ostling@ri.se)

# Thank you!

AFRY  
Carmenta  
Combitech  
Flanders/Belgium Road Authority/Mobilidata  
Göteborg stad  
Lindholmen Science Park  
Ramudden  
RISE  
Scania  
Statens Vegvesen  
Sweco  
Svensk Industri Standard, SIS  
Trafikverket  
Transportstyrelsen  
Uppsala stad  
Volvo Cars  
VTT, Technical Research Centre of Finland

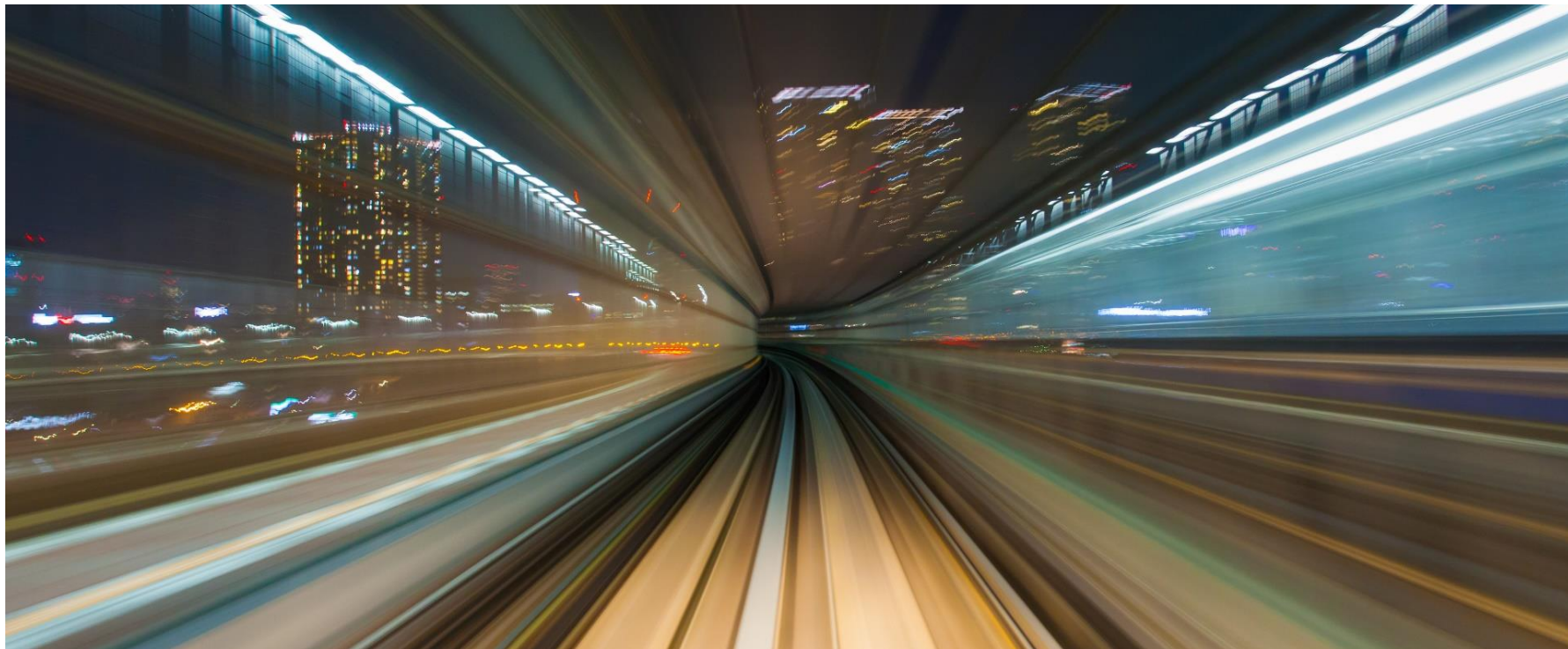


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# Q&A



# Lunch Break 11.30-12.30



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